Pain Physician, Volume 3, Number 1, pp 43-45
2000, Association of Pain Management Anesthesiologists®

Case Report

Laser-Assisted Percutaneous Endoscopic Neurolysis

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Endoscopic lysis of adhesive scar utilizing a steerable fiberoptic scope is currently being performed by a growing number of physicians. Various techniques and medications are presently being used to lyse epidural adhesions as a way of improving refractory lumbar radiculopathies. We present a case report discussing laser-assisted endoscopic lysis with radiographic images before and after laser-assisted neurolysis. We were able to demonstrate improvement in the filling of the nerve root with epidural contrast after the laser lysis of scar. This correlated with improvement in pain without neurologic deficit. The laser may represent a useful adjunct in the treatment of pain due to epidural fibrosis.

Keywords: Laser, spinal endoscopy, epidural fibrosis, lumbar radiculopathy, failed back

Spinal epidural endoscopy is currently being utilized as a new technique for visualization of the spinal canal and its contents, using a fiberoptic steerable catheter to safely deliver steroids and lyse epidural adhesions (1-5). Racz and colleagues (6-8) and others (5, 9, 10) have suggested that the lysis of epidural adhesions is of benefit to those with refractory low back pain. Saberski and coworkers (1-3), and others (4, 5) demonstrated that one could easily and safely visualize the contents of the spinal canal and the mobility of the scar associated with hydrostatic distention of the epidural space. Although there is no one definitive drug or technique for lysis of these scars, the adhesive tissue has often been implicated as one of the causative factors of the "failed back surgery syndrome."

There are multiple articles describing reoperation for epidural adhesions, with mixed results (11, 12). Consequently, many pain practitioners have attempted to manage refractory low back pain with nonoperative techniques. Success with various techniques such as infusions of lytic medications and solutions is likely related to the ability to lyse these scars without causing further scars which is often the case in reoperations. The laser may represent a tool that can further enhance the present medications and techniques currently utilized (13).

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CASE REPORT

A 47-year old man was disabled and retired from work due to intractable low back pain and left-leg sciatica. He underwent a laminectomy and discectomy at the L5-S1 level on the left and did well for about 13 months. He began experiencing left leg pain with cramping in the toes. The patient also described intermittent numbness and paresthesias involving the S-1 dermatomal distribution of the left foot. His physical examination was significant for a decreased left-ankle reflex, decreased straight leg raising to 75° and decreased sensation to pinprick in the left foot. The magnetic resonance imaging scan demonstrated postoperative changes with extensive perineural scarring at the operative site. The patient had tried physical therapy, medications, and epidural steroid injections including selective nerve-root-sleeve blockade, with mixed results. Although the injections afforded him the greatest relief, they provided relief for only 1 to 2 weeks. He continually scored his pain as "5" to "6" on the visual analog scale, with "0" as no pain and a maximum of "10." The patient was felt to be a good candidate for endoscopic epidural lysis of postoperative adhesive scarring.

The patient was placed in the prone position on a fluoroscopic table, with sterile preparation and draping of the caudal region including Ioban drape. Light intravenous

sedation and analgesia were utilized, as well as local anesthetic at the entry site. A Myelotec® epidural, steerable, fiberoptic catheter system was introduced into the caudal region through the sacral hiatus (Myelotec, Rosewell, GA) as described by Saberski and Kitahata (1). A Coherent SlimLine® 365 Holmium laser fiber was introduced through the steerable epiduroscope (Coherent Medical, Palo Alto, CA). Using fluoroscopic and visual guidance, the apparatus was advanced towards the L5-S1 level. An intra-operative contrast epidurogram with 6 cc of 180 concentration iohexol demonstrated poor filling at L5-S1, with essentially no contrast delineation of the S-1 root on the left side. This was consistent with prior surgery and epidural adhesions (Fig. 1). The visual appearance was of white fibrinous material, which was firm in nature and not easily moveable with gentle hydrodissection, as is sometimes seen. We were able to steer the apparatus towards the left side to work specifically on the root region. It spite of hydrodissection, contrast injected at the root region again failed to demonstrate adequate filling so it was felt that the laser could aid in the lysis of the scar.

The laser was initially set at 0.5-J output at five pulses/second. We lased intermittently in the region, with frequent readjustment of the catheter tip up against the scar tissue. At various times during the procedure, contrast was injected in small amounts to verify that the catheter had not moved. Our endpoint was based partly upon intraprocedural contrast studies, as well as patient discomfort. At no time were epidural anesthetics used, and if any discomfort or sensation was felt by the patient, the catheter tip was redirected. Total energy output used was 0.29-KJ. The postlaser contrast study displayed improved filling, with some contrast exiting the neural foramen outlining the S-1 root (Fig. 2). At that point in time, we were then able to advance the scope in a cephalad direction and contrast flowed freely into all regions. Before removal of the apparatus, the patient received an injection of supernatant-extracted triamcinolone, 40 mg, directed at the root and the laser region and the catheter was removed atraumatically. Except for some localized tenderness at the insertion site, the patient stated that he had no pain. He subsequently returned to work part-time with consid-

Fig. 1 - Digital endoscopic image of the epidural space prior to laser-assisted neurolysis

Fig. 2 - Digital endoscopic image of the epidural space after laser-assisted neurolysis

erable improvement in his quality of life. His present pain score is described as "0," with the worst days described as a "1" to "2" at 6 months postprocedure.

DISCUSSION

This case report demonstrates that the laser may represent a new technique that the pain practitioner can use for alleviation of chronic pain due to postoperative epidural fibrosis. Other methods employ the use of a variety of agents including hypertonic saline and hyaluronidase, with mixed results (5-10). The laser may offer an alternative with potentially instant results. Since there is no need to be concerned about fluid migration, this represents a potential benefit over other techniques for neurolysis. The improvement in this patient was felt to be due to the release of scar tissue around the nerve root, with a consequent release of traction. Since no bleeding occurs, it is felt that the risk for redevelopment of scar is significantly reduced, especially when compared to operative microneurolysis, where there is always some bleeding, either primary, secondary, or drainage into the operative bed from soft-tissue and osseous dissection. The patient's improvement was not induced by anesthetic blockade of the root, and it cannot be ascribed to the steroids or normal saline that were injected into the region during the procedure. It is also hoped that the long-term success, seen in cases when lysis of scar was accomplished with hydrodissection or prevention of connective-tissue deposition with steroid deposition, can be duplicated with laser lysis of scar.

Although the laser is not without risk of thermal damage with the potential for neural trauma, the authors feel that with proper training, the laser will become the optimal method for this type of procedure. It affords point-specific therapy and potential benefit for cyst drainage, vaporization of other lesions or tumors, or drainage of an abscess. As the equipment is improved and the visualization and steering/guiding capabilities refined, the laser may play a more important role in endoneurolysis.

CONCLUSION

This case report highlights the utilization of laser-assisted endoscopic lysis with the radiographic images before and after laser-assisted neurolysis. The laser may offer an alternative technique for neurolysis, with potentially instant results without risk of fluid migration, bleeding, local anesthetic administration, steroids, hypertonic saline, and hyaluronidase. As modern endoscopic equipment, as well as lasers, continues to improve, in terms of quality of technology and capabilities, the laser may play a more important role in neurolysis of epidural scar tissue. This report will hopefully open the doors to further trials with laser treatment of persistent low back and radicular pain secondary to epidural adhesions.

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